

Tennessee Consolidated Retirement System

Hybrid Pension Plans:

Teacher Retirement Plan

State and Higher Education Employee Retirement Plan

Actuarial Valuation and Report (for cash funding purposes)

June 30, 2022



CONSULTING GROUP

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Executive Summary and Certification

Funding Requirements

An actuarial valuation of the Hybrid Pension Plan was conducted as of June 30, 2022 for the Tennessee Consolidated Retirement System. The purpose of the valuation was to determine the funding requirements of the various components of the pension plan, with the intention that the funding requirements indicated by the valuation would be used as the basis for contributions commencing on July 1, 2023.

Actuarially Determined Contribution Rates

The Actuarially Determined Contribution Rates shown below represent the recommended contributions as a percentage of payroll for the current and previous valuations, based on the actuarial methods and assumptions as documented in the Basis for Valuation section of each applicable report.

State and Higher Education Employee Retirement Plan				
Valuation Date	Teacher Retirement Plan	General Employees	State Judges	Public Safety Officer Bridge Payments
June 30, 2022	2.95%	2.57%	8.19%	0.90%
June 30, 2021	2.87%	2.48%	8.22%	0.90%

The assets and liabilities of the Teacher Retirement Plan are legally separate from the assets of the State and Higher Education Employee Retirement Plan.

For allocation of pension cost related to differing benefit structure and eligibility, the State and Higher Education Employee Retirement Plan is comprised of three components: General Employees, State Judges, and Public Safety Officer (PSO) bridge payments. There is no legal separation of assets within the State and Higher Education Employee Retirement Plan.

Hereafter, in this report, the Teacher Retirement Plan will be referenced as “Teachers” and the State and Higher Education Employee Retirement Plan will be referenced as “State Plan”.

Analysis of Cost Controls and Unfunded Liability Controls

The hybrid plan was established pursuant to Public Chapter 259, Acts of 2013. The hybrid plan was designed with provisions to control employer pension costs and unfunded liability. A requirement of the annual actuarial valuation process is to determine if the two hybrid plans are within the control limits established by the governing statute. Each plan is evaluated separately. If a plan is not within the control limits, then this actuarial report shall include the adjustments that must occur to bring the plans within the statutory requirements.

The cost control provision is that the actuarially determined contribution rate shall not exceed 4% of payroll. The provision to control unfunded liability is that the maximum unfunded liability shall not exceed 12.5% of the five-year average of the state's long-term indebtedness.

The state has established a stabilization reserve account and plans to contribute to the stabilization reserve account when the actuarially determined contribution rate is less than 4% of payroll.

If the control provisions are exceeded, the adjustments will automatically occur in the following sequence:

1. Utilize funds in the stabilization reserve, if any
2. Reduce or suspend the 3% retiree COLA benefit
3. Shift some or all of the employer contributions from the defined contribution plan to the hybrid defined benefit plan
4. Increase employee contributions by 1% of salary
5. Reduce future service accrual below 1%
6. Freeze the plan, no future service accrual

When the employer cost is restored to 4% and the unfunded liabilities do not exceed the maximum level, then the adjustments previously made are restored on a prospective basis. The sequence is in reverse order.

Since the actuarially determined contribution rate is less than 4% and since the unfunded liability limits are not exceeded, then no adjustments are necessary as a result of the June 30, 2022 actuarial valuation.

Yearly Comparison of Selected Plan Information

The tables below present selected information as of the current and prior valuation dates for each group (Teachers, General Employees and Public Safety Officers, and State Judges).

Teacher Retirement Plan

	<u>June 30, 2021</u>	<u>June 30, 2022</u>	<u>% Change</u>
Number of Members			
Active Members	29,203	32,866	12.5%
Former Members	11,630	14,393	23.8%
Retired Members	53	120	126.4%
Total	40,886	47,379	15.9%
Active Participant Statistics			
Average Age	35.6	36.0	1.3%
Average Service	3.5	3.7	7.5%
Average Compensation	\$49,024	\$51,654	5.4%
Plan Assets (excluding stabilization reserve)			
Market Value of Assets (MVA)	\$538,191,260	\$626,065,787	16.3%
Actuarial Value of Assets (AVA)	476,829,540	628,099,894	31.7%
Plan Liability at Beginning of Year			
Actuarial Liability	\$503,022,086	\$666,126,770	32.4%
Funded Ratios			
MVA / Actuarial Liability	107.0%	94.0%	(13.0%)
AVA / Actuarial Liability	94.8%	94.3%	(0.5%)
Annual Funding Levels			
Normal Cost	\$37,113,419	\$44,464,677	19.8%
Actuarially Determined Contribution Rate	2.87%	2.95%	0.08%

General Employees and Public Safety Officers (PSO)

	<u>June 30, 2021</u>	<u>June 30, 2022</u>	<u>% Change</u>
Number of Members			
Active Members	26,162	28,334	8.3%
Former Members	19,364	23,594	21.8%
Retired Members	88	196	122.7%
Total	<u>45,614</u>	<u>52,124</u>	14.3%
Active Participant Statistics			
Average Age	39.8	40.2	1.2%
Average Service	3.0	3.3	8.4%
Average Compensation	\$46,505	\$49,878	7.3%
Plan Assets (excluding stabilization reserve)			
Market Value of Assets (MVA)	\$402,687,085	\$472,534,295	17.3%
Actuarial Value of Assets (AVA)	356,774,834	474,069,574	32.9%
Plan Liability at Beginning of Year			
Actuarial Liability	\$382,098,146	\$508,235,069	33.0%
Funded Ratios			
MVA / Actuarial Liability	105.4%	93.0%	(12.4%)
AVA / Actuarial Liability	93.4%	93.3%	(0.1%)
Annual Funding Levels			
Normal Cost	\$26,311,267	\$31,358,518	19.2%
Actuarially Determined Contribution Rate	2.50%	2.59%	0.09%
General Employees	2.48%	2.57%	0.09%
Public Safety Officer Bridge Payments	0.90%	0.90%	0.00%

State Judges

	<u>June 30, 2021</u>	<u>June 30, 2022</u>	<u>% Change</u>
Number of Members			
Active Members	57	67	17.5%
Former Members	5	5	0.0%
Retired Members	0	0	
Total	62	72	16.1%
Active Participant Statistics			
Average Age	55.5	55.4	(0.2%)
Average Service	5.0	5.2	4.6%
Average Compensation	\$180,993	\$183,511	1.4%
Plan Assets (excluding stabilization reserve)			
Market Value of Assets (MVA)	\$8,566,351	\$9,659,472	12.8%
Actuarial Value of Assets (AVA)	7,589,661	9,690,856	27.7%
Plan Liability at Beginning of Year			
Actuarial Liability	\$8,180,930	10,352,367	26.5%
Funded Ratios			
MVA / Actuarial Liability	104.7%	93.3%	(11.4%)
AVA / Actuarial Liability	92.8%	93.6%	0.8%
Annual Funding Levels			
Normal Cost	\$781,296	\$927,928	18.8%
Actuarially Determined Contribution Rate	8.22%	8.19%	(0.03%)

Risk Discussion – Actuarial Standards of Practice No. 51

Effective November 1, 2018, actuarial funding valuation reports are required to include a discussion of the risk associated with measuring pension obligations and determining pension plan contributions. The risks that may reasonably be anticipated to significantly affect the plan's future financial condition are discussed below. It is recommended that the plan sponsor continues to monitor these risks. Further analysis will be provided as requested separate from this report.

Cost Controls and Unfunded Liability Controls

As discussed earlier in this report, the hybrid plan was designed with provisions to control employer pension costs and unfunded liability. The cost control provision is that the actuarially determined contribution rate shall not exceed 4% of payroll. The provision to control unfunded liability is that the maximum unfunded liability shall not exceed 12.5% of the five year average of the state's long-term indebtedness. These provisions drastically reduce the effect that the risks below ultimately have on the plan's future financial condition, but these risks are still significant to the plan as they are primary factors in determining if or when any of the cost control adjustments will be required to occur in the future.

Investment Risk

The investment risk is expected to be the single most important factor in determining the future cost of the plan. Due to the plan's significant equity exposure and low correlation between fixed income assets and liabilities, there is risk that the funded status (and required cash contributions) of the plan could be very volatile. The history of annual investment returns (on a market value basis) is shown below.

Year Ending	Investment Return
June 30, 2022	(3.63) %
June 30, 2021	25.60
June 30, 2020	4.94
June 30, 2019	7.45
June 30, 2018	8.19
June 30, 2017	11.42
June 30, 2016	2.79
June 30, 2015	3.33

The historical returns above highlight the substantial volatility from year to year.

Interest Rate Risk

Related to the investment risk section above, the assumed future returns implied in the interest rate used to value the liabilities is a significant factor in determining the plan's funded status. Due to the plan's liability duration (a measurement of how sensitive the liability is to a change in the interest rate) of around 25-30, a 1% decrease in the assumed interest rate would increase the liability by

approximately 25-30%. The plan's liability duration is currently very high due to the relatively young population with projected benefit payments deferred many years into the future. The duration will decrease over time as the plan matures.

Inflation Risk

Since benefit amounts are pay-related, pay increases in excess of the valuation assumption will result in an increase in the liabilities (and required cash contributions) of the plan. An increase in inflation is one factor that could lead to higher pay increases. Further, an increase in inflation will also result in a higher COLA to retirees, which will increase the liabilities of the plan. However, the inflation risk is dampened due to inflation being a component of the interest rate used to value the liabilities. An increase in inflation would likely result in an increase in the interest rate, which could mitigate the pay and COLA increases.

Mortality Risk

Since the primary benefits of the plan are paid as annuities, the plan is sensitive to changes in the longevity of the population. As a result, the liabilities (and required cash contributions) of the plan will increase if the participants live longer than expected and decrease if they live shorter than expected. The current mortality assumption projects future longevity improvements, which generally dampens the mortality risk.

Contribution Risk

The required contributions calculated in this report are based on the actuarial methods and assumptions as documented in the Summary of Actuarial Methods and Assumptions section of the appendix. The required contribution includes the normal cost for new benefits being earned during the year, plus an amortization to cover any unfunded accrued liability over a period of 20 years or less. Based on this contribution method, all plan benefits are projected to be systematically funded. This method is not expected to cause additional volatility in the required contribution beyond the underlying risk factors discussed above.

Certification

Purpose and Use

This report has been prepared exclusively for the Tennessee Consolidated Retirement System to determine the funding level of the plan based on the June 30, 2022 valuation, and may not be appropriate for other purposes. A separate report will provide the financial disclosure items required by the Governmental Accounting Standards Board. USI Consulting Group is not responsible for consequences resulting from the use of any part of this report without prior authorization or approval. This report provides actuarial advice and does not constitute legal, accounting, tax or investment advice. Determinations for other purposes, such as bond ratings or judging benefit security, may be significantly different from the results shown in this report.

Actuarial findings in this report are based on actuarial assumptions which reflect expected plan experience. Although the deviation of the actual future plan experience and the expected experience inherently creates some uncertainty with the results, in our opinion the actuarial assumptions reasonably reflect the expected future experience of the plan. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of the assignment, we did not perform an analysis of the potential range of such future measurements.

Data

The calculations shown in this report have been prepared using employee data and plan documentation furnished by the Tennessee Consolidated Retirement System as of June 30, 2022 and plan assets furnished by the Tennessee Consolidated Retirement System for the twelve month period ending June 30, 2022. While we have not audited the data, we have reviewed it for reasonableness and internal consistency, and to the best of our knowledge, there are no material limitations to the data provided.

Subsequent Events

We are unaware of any subsequent event after the dates above which would have a material effect on the results presented in this report.

Assumptions, Methods and Procedures

The actuarial calculations contained in the report are built on deterministic actuarial modeling, making a single determination of liabilities and costs. Further, these actuarial calculations are based on a combination of demographic and asset data, as well as assumptions concerning future changes in these data. As such, the actuarial calculations contained herein are an estimate of projected future occurrences.

The actuarial liabilities shown in this report are determined using software purchased from an outside vendor which was developed for this purpose. Certain information is entered into this model in order to generate the liabilities. These inputs include economic and non-economic assumptions, plan provisions, and census information. We rely on the coding within the software to value the liabilities using the actuarial methods and assumptions selected. Both the input to and the output from the model is checked for accuracy and reviewed for reasonableness.

Changes in Plan Provisions, Actuarial Assumptions and Methods

The mortality improvement assumption adopted with the 2016 experience study utilizes the most current projection scale published by the Society of Actuaries as of the actuarial valuation date. As of June 30, 2022, the projection scale was updated from Scale MP-2020 to Scale MP-2021. This change resulted in an increase in the liabilities and contribution rates.

The load included in the Actuarially Determined Contribution Rates for administrative expenses was increased from 0.18% to 0.19% effective June 30, 2022. This change resulted in an increase in the contribution rates.

No other changes were made to the plan provisions, actuarial assumptions and methods effective June 30, 2022.

Summaries of the plan provisions, actuarial assumptions and methods can be found in the Basis for Valuation section of this report.

TCRS Funding Policy

This report was prepared in accordance with the funding policy adopted by the TCRS Board of Trustees.

Professional Qualifications

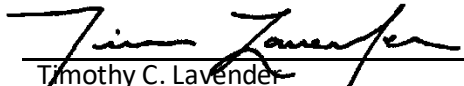
This report has been prepared under the supervision of Justin C. Thacker, a member of the American Academy of Actuaries, a Fellow of the Society of Actuaries, and a consulting actuary with USI Consulting Group, who has met the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions herein. To the best of our knowledge this report has been prepared in accordance with generally accepted actuarial standards, including the overall appropriateness of the analysis, assumptions, and results and conforms to appropriate Standards of Practice as promulgated from time to time by the Actuarial Standards Board, which standards form the basis for the actuarial report. We are not aware of any direct or material indirect financial interest or relationship, including investment management or other services that could create, or appear to create, a conflict of interest that would impair the objectivity of our work. The undersigned are available to provide supplemental information or explanation.



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August 4, 2023

Date



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August 4, 2023

Date

Funding Calculations

Unfunded Actuarial Liability (UAL)

For this purpose, the Unfunded Actuarial Liability (UAL) is the excess of the Actuarial Liability over the Actuarial Value of Assets as shown below.

		State Plan		
		General Employees & PSO	State Judges	Total State
	Teachers			
1. Actuarial Value of Assets	\$628,099,894	\$474,069,574	\$9,690,856	\$483,760,430
2. Actuarial Liability	666,126,770	508,235,069	10,352,367	518,587,436
Unfunded Actuarial Liability (2 – 1)	38,026,876	34,165,495	661,511	34,827,006

Pre-Existing UAL Amortizations

Date Established	Maximum Remaining Years	Contributory Teachers			Consolidated State			State Judges		
		Present			Present			Present		
		<u>Value</u>	<u>Years</u>	<u>Amortization</u>	<u>Value</u>	<u>Years</u>	<u>Amortization</u>	<u>Value</u>	<u>Years</u>	<u>Amortization</u>
June 30, 2003	1.00	---	---	---	---	---	---	---	---	---
June 30, 2004	2.00	---	---	---	---	---	---	---	---	---
June 30, 2005	3.00	---	---	---	---	---	---	---	---	---
June 30, 2006	4.00	---	---	---	---	---	---	---	---	---
June 30, 2007	5.00	---	---	---	---	---	---	---	---	---
June 30, 2008	6.00	---	---	---	---	---	---	---	---	---
June 30, 2009	7.00	---	---	---	---	---	---	---	---	---
June 30, 2010	8.00	---	---	---	---	---	---	---	---	---
June 30, 2011	9.00	---	---	---	---	---	---	---	---	---
June 30, 2012	10.00	---	---	---	---	---	---	---	---	---
June 30, 2013	11.00	---	---	---	---	---	---	---	---	---
June 30, 2014	12.00	---	---	---	---	---	---	---	---	---
June 30, 2015	13.00	---	---	---	---	---	---	---	---	---
June 30, 2016	14.00	---	---	---	---	---	---	---	---	---
June 30, 2017	15.00	1,988,067	15.00	201,260	2,917,617	15.00	295,362	0	15.00	0
June 30, 2018	16.00	5,358,035	16.00	522,557	4,128,159	16.00	402,610	0	16.00	0
June 30, 2019	17.00	(6,416,813)	17.00	(605,066)	389,516	17.00	36,729	203,863	17.00	19,223
June 30, 2020	18.00	(990,825)	18.00	(90,614)	4,106,027	18.00	375,509	(13,974)	18.00	(1,278)
June 30, 2021	19.00	25,564,755	19.00	2,273,807	13,065,632	19.00	1,162,097	385,539	19.00	34,291
Total		25,503,219		2,301,944	24,606,951		2,272,307	575,428		52,236

Total UAL Amortization

As of each valuation date, the plan establishes a new UAL Amortization Base equal to the excess of the UAL over the total present value (PV) of the pre-existing UAL Amortizations. The new Amortization Base is amortized over a period up to 20 years, and this amount is payable each year during the established period, unless it is deemed fully amortized earlier.

		State Plan	
		General Employees & PSO	State Judges
	Teachers		
1. Unfunded Actuarial Liability <i>(not less than zero)</i>	\$38,026,876	\$34,165,495	\$661,511
2. PV of Pre-Existing UAL Amortizations	25,503,219	24,606,951	575,428
3. New UAL Amortization Base <i>(1 – 2)</i>	12,523,657	9,558,544	86,083
4. New UAL Amortization <i>(3 amortized over 20 years)</i>	1,085,971	828,855	7,465
5. Pre-existing UAL Amortizations	2,301,944	2,272,307	52,236
6. Total UAL Amortization <i>(4 + 5)</i>	3,387,915	3,101,162	59,701
7. Projected Payroll	1,792,743,734	1,485,527,315	12,769,162
Total UAL Amortization as % of Pay <i>(6 / 7)</i>	0.19%	0.21%	0.47%

Actuarially Determined Contribution Rate

The Actuarially Determined Contribution Rates shown below represent the recommended contributions as a percentage of payroll, based on the actuarial methods and assumptions as documented in the Basis for Valuation section of this report.

		State Plan	
		General Employees & PSO	State Judges
	Teachers		
1. Normal Cost	\$44,464,677	\$31,358,518	\$927,928
2. Projected Payroll	1,792,743,734	1,485,527,315	12,769,162
3. Normal Cost as % of Pay (1 / 2)	2.48%	2.11%	7.27%
4. Total UAL Amortization as % of Pay	0.19%	0.21%	0.47%
Actuarially Determined Contribution Rate ($[(3 + 4) \times 1.03375 + 0.19\%]$)	2.95%	2.59%	8.19%
General Employees	n/a	2.57%	n/a
Public Safety Officer Bridge Payments	n/a	0.90%	n/a

Plan Assets

Change in Market Value of Assets

The change in the Market Value of Assets for the twelve months ending on the valuation date is shown below. The market value of assets used for the actuarial funding valuation excludes assets in the stabilization reserve.

		State Plan			
	Teachers	General Employees & PSO	State Judges	Total State	Grand Total
1. Market Value of Assets as of June 30, 2021	\$538,191,260	\$402,687,085	\$8,566,351	\$411,253,436	\$949,444,696
2. Employer Contributions	34,324,801	26,944,274	854,029	27,798,303	62,123,104
3. Employee Contributions	85,515,025	70,667,627	601,029	71,268,656	156,783,681
4. Investment Income	(22,704,311)	(17,067,793)	(355,424)	(17,423,217)	(40,127,528)
5. Benefit Payments	(374,976)	(732,011)	0	(732,011)	(1,106,987)
6. Refund of Employee Contributions	(5,588,325)	(7,249,413)	0	(7,249,413)	(12,837,738)
7. Administrative Expense	(3,197,350)	(2,715,474)	(6,513)	(2,721,987)	(5,919,337)
8. Net Transfers	(100,337)	0	0	0	(100,337)
Market Value of Assets as of June 30, 2022 (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8)	626,065,787	472,534,295	9,659,472	482,193,767	1,108,259,554

Net transfers within a given year may not reconcile to zero due to timing

History of Investment Gains/Losses

The investment gain or loss for each year is determined by comparing the expected investment return to the actual investment earnings as shown below. The result is then used in the development of the Actuarial Value of Assets on the following page.

<u>Year Ending</u>	<u>Actual Investment Return</u>	<u>Expected Investment Return</u>	<u>Investment Gain/(Loss)</u>	<u>Recognized as of June 30, 2022</u>	<u>Deferred as of June 30, 2022</u>
June 30, 2022	(\$40,127,528)	\$70,801,823	(\$110,929,351)	(\$11,092,935)	(\$99,836,416)
June 30, 2021	177,068,217	49,763,551	127,304,666	25,460,934	101,843,732
June 30, 2020	24,801,920	36,252,161	(11,450,241)	(3,435,072)	(8,015,169)
June 30, 2019	25,095,136	24,434,674	660,462	264,184	396,278
June 30, 2018	17,331,564	15,137,943	2,193,621	1,096,810	1,096,811
June 30, 2017	12,739,958	8,423,718	4,316,240	2,589,744	1,726,496
June 30, 2016	1,312,088	3,687,933	(2,375,845)	(1,663,095)	(712,750)
June 30, 2015	347,529	846,281	(498,752)	(399,000)	(99,752)
June 30, 2014	n/a	n/a	n/a	n/a	n/a
June 30, 2013	n/a	n/a	n/a	n/a	n/a
Total Deferred Gain/(Loss):					(\$3,600,770)

Actuarial Value of Assets

The development of the Actuarial Value of Assets as of the valuation date is shown below.

	<u>June 30, 2022</u>
1. Market Value of Assets	\$1,108,259,554
2. Total Deferred Gain/(Loss)	(3,600,770)
3. Preliminary Actuarial Value of Assets (1 – 2)	1,111,860,324
4. Actuarial Value of Assets (3 but not less than 80% of 1 or greater than 120% of 1)	1,111,860,324
Ratio of Actuarial Value to Market Value (4 / 1)	100.32%

	<u>State Plan</u>				
	<u>Teachers</u>	<u>General Employees & PSO</u>	<u>State Judges</u>	<u>Total State</u>	<u>Grand Total</u>
1. Market Value of Assets as of June 30, 2022	\$626,065,787	\$472,534,295	\$9,659,472	\$482,193,767	\$1,108,259,554
2. Ratio of Actuarial Value to Market Value	100.32%	100.32%	100.32%	100.32%	100.32%
Actuarial Value of Assets as of June 30, 2022	628,099,894	474,069,574	9,690,856	483,760,430	1,111,860,324

Actuarial Balance Sheet

As of June 30, 2022

As of June 30, 2022		State Plan		
ASSETS	Teachers	General Employees & PSO	State Judges	Total State
Present assets creditable to:				
State Accumulation Fund	\$218,834,970	\$152,506,030	\$6,097,219	\$158,603,249
Members' Fund	409,264,924	321,563,544	3,593,637	325,157,181
Total Present Assets	\$628,099,894	\$474,069,574	\$9,690,856	\$483,760,430
Present value of prospective contributions payable to:				
State Accumulation Fund:				
Normal Cost	\$493,557,480	\$251,777,575	\$7,383,823	\$259,161,398
Accrued Liability	38,026,876	34,165,495	661,511	34,827,006
Total	\$531,584,356	\$285,943,070	\$8,045,334	\$293,988,404
Members' Fund	1,220,250,819	833,586,399	5,368,181	838,954,580
Total Prospective Contributions	\$1,751,835,175	\$1,119,529,469	\$13,413,515	\$1,132,942,984
Total Assets	\$2,379,935,069	\$1,593,599,043	\$23,104,371	\$1,616,703,414
LIABILITIES				
Present value of prospective benefits payable on accounts of:				
Present retired members and contingent annuitants				
	\$4,514,944	\$6,731,112	\$0	\$6,731,112
Present active members*	2,295,399,406	1,516,118,676	23,096,553	1,539,215,229
Former members	80,020,719	70,749,255	7,818	70,757,073
Total Liabilities	\$2,379,935,069	\$1,593,599,043	\$23,104,371	\$1,616,703,414

* Active members for each group include members who were formerly employed by the group but are currently employed by another group within TCRS.

Basis for Valuations

Summary of Plan Provisions

Eligibility

All employees included in the census data provided by the Tennessee Consolidated Retirement System were considered to be eligible members.

Definitions

Creditable Service: Creditable Service means the period of a member's continuous service since his last date of employment with the employer, and may also include service prior thereto. In particular, additional service may be credited for certain periods of military service and service before the date of membership for which the member makes the required contributions.

Normal Retirement Date: Teachers and State General Employees

The first day of the month coincident with or next following the earlier of the date the member has attained age 65 and 5 years of Creditable Service, or the date the member's age and years of Creditable Service sum to 90.

Public Safety Officers are eligible upon attainment of age 60 and 5 years of Creditable Service (or age 55 and 25 years of Creditable Service) or at any age upon completion of 30 years of service.

General Assembly members are eligible upon attainment of age 60 and 4 years of Creditable Service.

State Judges

The first day of the month coincident with or next following the earlier of the date the member has attained age 60 and 8 years of Creditable Service, or the date the member has attained age 55 and 24 years of Creditable Service.

Early Retirement Date: A vested member may terminate employment and receive a reduced early retirement benefit upon attaining age 60, or the date the member's age and years of Creditable Service sum to 80.

Tennessee Consolidated Retirement System (Hybrid Pension Plans)

Late Retirement Date:	A participant may defer retirement beyond the Normal Retirement Date.
Average Final Compensation:	The average annual earnings of a member for the five consecutive years of Creditable Service which produce the highest average.
Accrued Benefit:	One-twelfth of the annual benefit amount below, but not to exceed one-twelfth of the lesser of \$80,000 (indexed annually from July 1, 2014) or 90% of Average Final Compensation:

Teachers and State General Employees

1% of Average Final Compensation multiplied by the number of years of Creditable Service.

Public Safety Officers are eligible for a supplemental bridge benefit beginning at the latter of age 55 or the date of retirement and continuing until the earlier of death or age 62. The service retirement bridge is equal to 0.75% of the Average Final Compensation multiplied by the Creditable Service. The initial supplemental benefit may not exceed 22.5% of the member's Average Final Compensation.

State Judges

1.6% of Average Final Compensation multiplied by the number of years of Creditable Service.

Benefits Paid Upon the Following Events

Normal Retirement Benefit:	Monthly amount equal to the participant's Accrued Benefit.
Early Retirement Benefit:	Accrued Benefit actuarially reduced from the Normal Retirement Date to the Early Retirement Date.
Late Retirement Benefit:	Monthly amount equal to the participant's Accrued Benefit determined as of the Late Retirement Date.
Termination Benefit:	The Accrued Benefit is 100% vested after 5 years of service (8 years for State Judges), payable at the Normal Retirement Date. A reduced benefit may commence at the Early Retirement Date.
Disability Benefits:	The disability retirement benefit, commencing on the first day of the month immediately following determination of disability and payable

during the continuance of disability, is equal to 90% of the service retirement benefit that would have been payable.

Death Benefits:

Death benefits available are as follows:

- Lump Sum Refund
- Line-of-Duty Benefit
- 100% Joint and Survivor Annuity for Spouse after Vesting
- 100% Joint and Survivor Annuity for Any Beneficiary After Reaching Early Retirement Eligibility

Refund of Contributions:

If employment is otherwise terminated before a vested retirement benefit is available, no benefits are provided under the plan, and the member will receive a refund of his contributions (if any) to the plan with interest.

Forms of Payment

Normal Form:

Life Annuity

Optional Forms:

Subject to plan conditions, a member may select an optional method of benefit payment, in lieu of the normal form, which is actuarially equivalent thereto. The purpose of the optional method is to provide a continued life income to a surviving beneficiary after the death of a member.

Other Plan Provisions

Cost of Living Adjustments:

Each year the retirement benefits being paid are subject to an increase determined by applying a formula based on the increase in the Consumer Price Index. The maximum increase is 3% of the current benefit amount.

Member Contributions:

Each member contributes an amount equal to 5% of compensation each year.

Minimum Benefit:

General Assembly members will receive a minimum benefit allowance of \$55 per month for each year of Creditable Service (indexed annually from July 1, 2014).

Summary of Actuarial Assumptions

Unless noted below, all assumptions are a combination of estimated future experience and estimates inherent in market data or plan experience.

Interest Rate

6.75% per annum

Salary Increases

Age	Rate
20	8.72%
30	6.48%
40	5.10%
50	4.02%
60	3.54%
65	3.46%

Increase in Social Security Wage Base

2.75% annual increase

Cost of Living Adjustment

2.125% per annum

Inflation

2.25% annual rate of inflation is assumed in establishing economic assumptions

Marital Status

(a) Percent married –

Eligible for service retirement – 80%

Ineligible for service retirement – 75%

(b) Age difference – males are assumed to be four years older than spouse

Post-Retirement Mortality (Base Rates)

(a) Service Retirement – base rates developed in the 2020 experience study as follows:

1. Teachers and State Judges:

Males – 119% of Pub-2010 Teacher Below Median Mortality Table for Healthy Retirees

Females – 118% of Pub-2010 Teacher Below Median Mortality Table for Healthy Retirees

2. Other Employees:

Males – 106% of Pub-2010 General Below Median Mortality Table for Healthy Retirees

Females – 114% of Pub-2010 General Below Median Mortality Table for Healthy Retirees

(b) Disability Retirement – 110% of the mortality rates published in IRS Revenue Ruling 96-7 for disabilities occurring before January 1, 1995

Pre-Retirement Mortality (Base Rates)

(a) Teachers and State Judges – Pub-2010 Teacher Mortality Table for Employees

(b) Others – Pub-2010 General Mortality Table for Employees

Mortality Improvement

The mortality tables for service retirement include projected mortality improvement from 2010 to 2018 (the mid-year of the last TCRS experience study) using Scale MP-2020 and generational improvement after 2018 using the most current projection scale published by the Society of Actuaries as of the actuarial valuation date (Scale MP-2021 as of June 30, 2022).

The mortality tables for disability retirement include generational improvement after 2018 (the mid-year of the last TCRS experience study) using the most current projection scale published by the Society of Actuaries as of the actuarial valuation date (Scale MP-2021 as of June 30, 2022).

The pre-retirement mortality tables include generational improvement after 2010 using the most current projection scale published by the Society of Actuaries as of the actuarial valuation date (Scale MP-2021 as of June 30, 2022).

Withdrawal and Disability Rates – Teachers and State Judges

Male

Age	Withdrawal Rates			Disability Rates
	First Year	Second Year	Later	
20	16.20%	13.50%	9.99%	0.01%
25	16.20%	13.50%	8.47%	0.01%
30	16.20%	13.50%	6.01%	0.01%
35	16.20%	13.50%	3.62%	0.03%
40	16.20%	13.50%	2.00%	0.08%
45	16.55%	13.50%	1.46%	0.14%
50	17.76%	14.18%	1.97%	0.17%
55	19.85%	16.77%	3.14%	0.17%
60	22.94%	21.64%	4.66%	0.00%
65	25.20%	23.50%	0.00%	0.00%

Female

Age	Withdrawal Rates			Disability Rates
	First Year	Second Year	Later	
20	16.20%	13.50%	10.50%	0.01%
25	16.20%	13.50%	9.99%	0.01%
30	16.20%	13.50%	7.58%	0.01%
35	16.20%	13.50%	4.65%	0.03%
40	16.20%	13.50%	2.25%	0.08%
45	16.55%	13.50%	1.11%	0.14%
50	17.76%	14.18%	1.62%	0.17%
55	19.85%	16.77%	3.85%	0.17%
60	22.94%	21.64%	5.00%	0.00%
65	25.20%	23.50%	0.00%	0.00%

Withdrawal and Disability Rates – Other Employees

Male

Age	Withdrawal Rates			Disability Rates
	First Year	Second Year	Later	
20	29.99%	24.63%	19.53%	0.06%
25	25.37%	21.36%	15.89%	0.06%
30	22.98%	18.58%	10.53%	0.07%
35	20.80%	16.07%	5.76%	0.11%
40	18.61%	13.82%	2.84%	0.16%
45	16.48%	12.03%	1.99%	0.22%
50	14.81%	11.08%	2.39%	0.27%
55	15.28%	11.60%	2.86%	0.27%
60	17.91%	14.39%	4.68%	0.00%
65	24.04%	20.48%	0.00%	0.00%

Female

Age	Withdrawal Rates			Disability Rates
	First Year	Second Year	Later	
20	29.99%	24.63%	20.15%	0.03%
25	25.37%	21.36%	16.30%	0.03%
30	22.98%	18.58%	11.38%	0.04%
35	20.80%	16.07%	6.93%	0.06%
40	18.61%	13.82%	3.77%	0.14%
45	16.48%	12.03%	2.47%	0.24%
50	14.81%	11.08%	2.58%	0.33%
55	15.28%	11.60%	3.76%	0.38%
60	17.91%	14.39%	5.39%	0.00%
65	24.04%	20.48%	0.00%	0.00%

Rates of Retirement

Credible experience is not yet available for the Hybrid Pension Plans. The following rates were developed from TCRS experience and are applied at each age at which a member is eligible for an unreduced service retirement benefit (which will result in different retirement patterns for each plan based on the applicable eligibility requirements):

Age	Teachers		Other Employees	
	Male	Female	Male	Female
50	6.5%	6.5%	6.0%	7.5%
51	7.0%	7.0%	6.0%	7.5%
52	7.0%	8.0%	6.0%	7.5%
53	8.5%	9.0%	6.0%	7.5%
54	9.0%	10.0%	6.5%	7.5%
55	10.0%	10.0%	6.5%	7.5%
56	12.0%	12.0%	7.0%	8.0%
57	12.0%	14.0%	7.0%	8.0%
58	13.0%	14.0%	7.5%	8.0%
59	14.0%	15.0%	8.0%	8.0%
60	15.0%	17.0%	8.5%	9.0%
61	16.0%	20.0%	11.0%	12.0%
62	22.0%	26.0%	16.0%	18.0%
63	16.0%	19.5%	12.0%	12.0%
64	18.0%	24.0%	14.0%	14.0%
65	35.0%	37.5%	22.0%	22.0%
66	16.0%	24.0%	15.5%	17.0%
67	16.0%	24.0%	15.5%	17.0%
68	16.0%	24.0%	15.5%	17.0%
69	16.0%	24.0%	15.5%	17.0%
70	16.0%	34.0%	15.5%	17.0%
71	17.0%	40.0%	15.5%	17.0%
72	17.0%	40.0%	15.5%	17.0%
73	17.0%	40.0%	15.5%	17.0%
74	17.0%	40.0%	15.5%	17.0%
75	100.0%	100.0%	100.0%	100.0%

Additional increments for retirees who have fifteen or more years of service at retirement on or after age 60:

7.0%	7.0%	3.0%	3.0%
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Additional increments for retirees in the year in which they are first eligible for unreduced retirement prior to age 60:

12.5%	12.5%	9.0%	9.0%
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Commencement Dates and Forms of Payment

Retiring participants are assumed to elect the normal form of payment commencing immediately.

Terminating participants and inactive participants who are entitled to future benefits are assumed to elect the normal form of payment commencing at the age at which a member is eligible for an unreduced service retirement benefit.

Expenses

The assumed Interest Rate disclosed above is net of investment expenses. A 0.19% load is included in the Actuarially Determined Contribution Rates for administrative expenses.

Selection of Assumptions

The TCRS Board of Trustees selected the assumptions described above based on the review of TCRS experience in conjunction with an experience study conducted as of June 30, 2020. A complete plan experience study is conducted every four years.

Summary of Actuarial Methods

Actuarial Cost Method

Entry Age Normal

Asset Valuation Method

Assets are valued using a 10-year smoothing method based on fair market value as of the valuation date. Gains and losses relative to the assumed interest rate are phased in 10% each year, with the result constrained to be within 20% of market value.

Amortization Method

Layered amortization method in which each new UAL Amortization Base is amortized over a closed period not to exceed 20 years. Level dollar amortization is utilized.

Effect of Revised Actuarial Methods and Assumptions on Key Valuation Results

The mortality improvement assumption adopted with the 2016 experience study utilizes the most current projection scale published by the Society of Actuaries as of the actuarial valuation date. As of June 30, 2022, the projection scale was updated from Scale MP-2020 to Scale MP-2021. This change resulted in an increase in the liabilities and contribution rates.

The load included in the Actuarially Determined Contribution Rates for administrative expenses was increased from 0.18% to 0.19% effective June 30, 2022. This change resulted in an increase in the contribution rates.

There were no other changes in actuarial methods and assumptions since the previous valuation that impacted results.

Summary of Participant Data

Subject to approval by the Tennessee Consolidated Retirement System, a summary of the participant data is available upon request.

Summary of Asset Allocation

As of June 30, 2022, plan assets were allocated as follows.

Asset Class	Allocation
Domestic Equity	28.1%
Domestic Fixed Income	22.5%
International Equity	9.4%
International Fixed Income	0.0%
Short-Term Securities	5.5%
Real Estate	12.0%
Private Equity & Strategic Lending	22.5%
Total	100.0%